KEYBOARD INSTRUMENTS

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The Specious Uniformity of Italian Harpsichords

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Every commentator on the Italian school of harpsichord-building has remarked on the comparatively small amount of development that took place in Italian instruments between the sixteenth and eighteenth centuries. The reason that most of the surviving sixteenth-century harpsichords are Italian is, indeed, that they sufficiently resembled the later ones to be retained in musical use until the beginning of the nineteenth century. It should not, however, be assumed that there were no significant changes during the three centuries covered by surviving examples or that the earlier harpsichords have reached us intact. Close examination reveals a surprising number of alterations which have to be considered when trying to reconstruct the dispositions, compasses, and scalings that these instruments originally possessed.

The Raymond Russell Collection of the University of Edinburgh contains two Italian harpsichords, one inscribed 'Stephanus Bolcionius Pratensis 1627', the other anonymous but probably also from the first half of the seventeenth century.[1] The alterations to be observed in the first, which was fraudulently equipped with three keyboards, are of a different kind from those which form the subject of this article, but one original feature is of interest because of the light it throws on the original state of the anonymous instrument. The Bolcioni originally had only a single keyboard and two unison stops, but the original box slides which guide the jacks were not discarded when the instrument was altered.[2] The spacing of the jacks in an Italian harpsichord is usually such that 12 jacks occupy an octave-span of about 165 mm (6.5), but the spacing of the slots in the Bolcioni slides yields a reduced 'octave' which varies from 159 mm (6.25) in the bass to 155 mm (6.12) in the treble. Originally, there were 53 jacks in each row rather than the 52 required for the present C/E–g''' compass. The explanation is doubtless that, like so many other harpsichords and virginals of the early seventeenth century, the Bolcioni was fitted with divided accidentals for the purpose of extending the range of modulations possible with the meantone system of tuning. The middle octaves of such instruments have 13, 14, or 15 notes, depending on the number of accidentals divided. The most likely compass using 53 notes is C/E–c''' with a broken octave (additional F♯ and G♯ behind the notes playing D and E) in the bass and six divided

accidentals in the upper octaves : d♯/e♭, g♯/a♭, a♯/b♭, d♯′/e♭′, g♯′/a♭′, and a♯′/b♭′.

The anonymous harpsichord invites suspicion because it has a chromatic compass C–d‴. The alterations are not very obvious, and the keyboard could easily be believed to be original;[3] but a close inspection reveals that the balance mortises of the keys are not as worn as one would expect from the hollowing of the ivories. Also, the six highest accidentals have tops made in two pieces, neatly glued together and mounted on one lever. The string plan has been altered, the evidence being a series of plugged holes in the treble half of the soundboard bridge (matched by similar alterations of the hitchpin positions) and the fact that the middle strings are not quite parallel to the others. Since there are no corresponding plugged holes in the wrestplank bridge, it must be a replacement.

The plugged holes in the soundboard bridge are more closely spaced than the present strings. When the original string spacing is reconstructed from the unaltered pins in the bass and the plugged holes in the treble, it is found to be uniform, with 12 notes occupying only 147 mm (5.8). As with the Bolcioni, this can only mean that the original keyboard had divided accidentals. A total of 57 string pairs is indicated by the plugged holes, but there may have been 58 if the bridge had originally been a little longer in the treble. The most likely compass for 58 notes would be C/E–f‴ with a broken octave and six divided accidentals, probably the same ones as postulated for the Bolcioni.

Such a keyboard would have been obsolete in the later years of the eighteenth century, when the short octave was abandoned and well-tempered tunings had replaced meantone. A clever harpsichord-maker, however, could have brought the instrument up to date for much less than the cost of a new one. In actual fact, the modernising of this harpsichord involved making a new keyboard, although the ivory and ebony facings of the original keys were utilised, resulting in the composite sharp tops, which were bunched at the extreme treble where they would be less noticeable. Parts of the old keyframe were probably re-used as well. The original closely pinned wrestplank bridge and the closely spaced jack guides (probably box slides) were replaced. The new, normally spaced jack guides took the form of separate upper and lower guides of Italian pattern, which in itself is probably an indication of eighteenth-century work. The old tuning-pin holes are presumably to be found plugged underneath a capping piece which now covers part of the wrestplank. The original jacks probably survived the eighteenth-century alteration, but this cannot now be verified since unfortunately, they did not survive a 1948 restoration.

Although the spacing between the jacks was increased, the nar-

row spacing of the soundboard bridge pins in the bass and tenor was retained. This resulted in a misalignment of the strings in the middle of the compass, which was corrected by repinning part of the treble. The new keyboard had the same overall width as the old, but the change of compass had the additional effect of reducing the scale of the longer c″ string from 282 mm (11.1) to 264 mm (10.4), so that it conformed nicely to eighteenth-century practice. After these alterations, the octave doubling of the string lengths was still almost as accurate as that on a specially made instrument.

Another harpsichord which exhibits interesting alterations is the Antonius Baffo of 1574 in the Victoria and Albert Museum, London.[4] Its keyboard compass was originally C/E–f‴, which was subsequently altered to GG/BB–c‴ by the following procedure:

1. Key C/E and keys c‴ to e‴ inclusive were stripped of their keyplates and arcades, and the bare levers were discarded. A board 376 mm × 93 mm × 14 mm (14.8 × 3.65 × 0.55) was prepared from which to cut the new keys GG/BB–E required for extending the bass. (This board was beech, whereas the original keys were sycamore.)

2. The keyframe was cut at the line between c‴ and d‴. This left the three rails unsupported, but the tie running from front to back which had just been removed was refitted, even though it was 8 mm (0.3) too short to fit perfectly. A simple extension to the frame was constructed at the bass end, utilising the portion of balance rail removed from the treble end.

3. The new uncut keys of the bass section were marked out, drilled in position, and then cut apart, after which the old arcades and keyplates were fitted. Key f‴ was lengthened slightly to form the new full-width c‴, and the balance pin was repositioned to suit it.[5]

This harpsichord underwent another alteration, possibly at the same time. There are clear marks on the soundboard showing that the instrument at one time possessed an octave register, and there is convincing evidence that this was its original state. The positions of the octave hitchpins are very obvious; above the middle of the compass it is also possible to see where the octave bridge pins were, since the holes drilled for them penetrated the soundboard. If the octave bridge had been higher in the bass than in the treble, this would explain why the holes, drilled carefully to constant depth by using a stop, would not show in the bass.[6] The position of the octave bridge on the wrestplank is similarly revealed by pinholes, permitting an accurate measurement of the octave scaling. Assuming that the octave jacks plucked toward the right, the scale was 396 mm (15.6), which agrees with that of the unison strings, assuming that these were plucked to the left.

The layout of this harpsichord is an almost exact antithesis of Flemish practice. The wrestplank bridges were close together, with both sets of tuning pins in front of the unison wrestplank bridge.[7] With this arrangement, it does not make sense to pluck the shorter set of strings with the farther row of jacks, so it must be assumed that the octave jacks formed the front row. One of the box slides has the word 'Otava' written on it, and this slide was certainly in the front position when it and the wrest-plank were being bored by woodworms.

When the second unison choir was substituted for the octave, the octave bridges and hitchpins were removed, and the jacks of the front row were lengthened so that their plectra would reach the level of the unison bridges. The substitution of a second unison for the original octave register and the keyboard alteration (which had the effect of raising the pitch by a fourth, if it is assumed that the strings themselves remained tuned to the same pitches) were both modernisations, in that they made the instrument similar to those being built at the time the rebuilding was done.[8]

A very similar history can be deduced for the 1531 harpsichord by Alessandro Trasuntino in the Donaldson Collection of the Royal College of Music, London. Like the 1574 Baffo, the Trasuntino has the plugged hitchpin holes of an octave register in its soundboard. The line of these holes and that of the bridge, whose position can now only be inferred, fit neatly with the positions of the three fine roses. Since only 44 hitchpin holes can be found, the octave stop presumably reached only to b″. Confirmation that there was only one unison choir of strings, and that it was in the left-hand position, is found in a short extension piece to the soundboard bridge, which has been added to carry the topmost string. (This eliminates the possibility that the octave register reverted to unison pitch for the six top notes.) The wrestplank bridge is obviously a replacement, since it has no corresponding extension, differs in its moulding, and has no holes or slots through which the octave strings could pass.

A thoroughgoing keyboard alteration has also taken place in which the original keys and balance rail were completely replaced. The part of the keybed which appears to be original consists of the front and back rails, the slotted rear guide rack, and the endpieces. Strips of wood have been glued under all these parts to raise the keyboard by 10 mm (0.4), probably for the purpose of bringing the octave jacks to the level of the unison strings without having to lengthen them individually. The balance rail, however, must date from the time when these strips were added, since their absence would leave it protruding below the level of the original parts of the keyframe. The added strips raise the balance rail about 3 mm

(0.1) clear of the baseboard of the harpsichord. The key levers are made of the same wood as the balance rail and clearly date from the same period, although the keyplates and arcades are probably original.[9]

The original compass of the 1574 Baffo harpsichord was established by the presence of most of the keys and balance rail. In the Trasuntino they are missing, and no such positive deduction may be made. We can surely assume, however, that the original compass was different from the present G G/B B–c‴, and it is highly probable that it was the same as that of the Baffo, C/E–f‴. If this is so, and if the present unison wrestplank bridge is in the same position as that of the original, then Trasuntino must have used a scale of 363 mm (14.3).

Another harpsichord by Alessandro Trasuntino is in the Collection of the Brussels Conservatoire. This instrument appears to have had an even more complicated history of alterations, the elucidation of which would be difficult without reference to the Donaldson instrument just described. The Brussels Trasuntino was made in 1538 and is strung at present with one unison and one octave choir, although at one time it had two unison registers, as shown by the still-extant bridge pins and hitchpins for a second unison register. It is easy to see from their inferior workmanship that both of the wrestplank bridges and the octave soundboard bridge are replacements. The unison soundboard bridge, however, is finely made and the hitchpin holes in the soundboard for the octave stop also have the accurate placement that one expects to find in original work.

The original specification is suggested by examination of the unison soundboard bridge. Conveniently, a consistent difference can be observed between the placing of the two sets of pins, one set being farther away from the ridge of the moulding than the other, presumably original, set. The conclusion that only one set is original is confirmed by consistent differences in the sets of unison hitchpins. Since the octave hitchpin holes in the soundboard are very accurately placed along a scribed line and have every appearance of originality, we may safely conclude that the harpsichord was built with one unison and one octave register.

This specification has clearly been changed at some later date to give two unisons, and the original octave bridges and hitchpins were probably removed at this time. The original unison wrestplank bridge seems to have been replaced at the same time because the present bridge has had pins for two choirs of strings. The reason that the original bridge was not retained may possibly have been that the holes through which the octave strings passed were in the way of the new set of pins. Instead of lengthening the octave

jacks individually when converting them to play the new unison strings at a higher level, battens 5 mm (0.2) thick were placed under the keyboard, and the old unison jacks shortened instead.

Later still, the octave choir was reinstated with new octave bridges on the wrestplank and the soundboard and with new hitch-pins, mostly in the original holes, yielding the state in which it is now found. The unison wrestplank bridge was drilled to allow the octave strings to pass through it, and the second set of bridge pins had to be withdrawn in order to drill these holes.

There is one feature which suggests that the work was performed by someone unfamiliar with the Italian practice of placing the octave jacks in the front row : the reinstated octave register uses the back row of jacks, marked with a double line, which were shortened for this purpose.

The present keyboard is dated 1669 and has a compass of D–e‴, without e♭‴ (50 notes). This is an unusual compass, inexplicable in terms of the demands of written music, but it may have been chosen simply to give a desired pitch. The scale then became 284 mm (11.2). The most likely original compass is C/E–f‴, which would give a scale of 318 mm (12.5) with the present position of the unison wrestplank bridge.

The same combination of C/E–f‴ compass, long scale, and a disposition of one unison and one octave has been established for the 1585 harpsichord by Alexander Bortolotti in the collection of the Brussels Conservatoire, which still has its octave bridges.[10] Thomas and Rhodes[11] give the string lengths for its present compass of GG/BB–c‴ but acknowledge in their postscript that the original compass was C/E–f‴. When this is taken into account, the scale becomes 351 mm (13.8). Thomas and Rhodes found evidence that the right-hand unison was not original, a finding corroborated by the fact that the octave scale matched that of the left-hand unison.

The effect of the alterations to these four sixteenth-century harpsichords was to give them the disposition and scale appropriate to the seventeenth and eighteenth centuries (although the Baffo scale still remained rather long by eighteenth-century standards). Doubtless the instruments owe their survival to these successful modifications, which would have given them a new lease of life. It is, of course, their altered states that are recorded in the current textbooks, giving rise to the erroneous belief that sixteenth-century Italian makers used shorter scales for their harpsichords than for their virginals. Most sixteenth-century virginal scales lie between 307 mm (12.1)[12] and 390 mm (15.4),[13] and some of the apparent exceptions may be of later date.[14] The scales deduced above for the four harpsichords cover a similar range.

An inescapable question raised by the long scales deduced for these four sixteenth-century harpsichords is that of their intended pitch. It is particularly noticeable that the practice of doubling the string length for each octave is accurately observed in both unison and octave registers of Italian harpsichords except for the lowest five or six notes, which are foreshortened as a matter of convenience. That makers observed this rule, usually with a deviation of less than ± 2 per cent, is an indication that it had some practical importance. Undoubtedly, their intention was to obtain the best tone from their strings by stressing them near to the breaking point in all parts of the compass. Thomas and Rhodes have explained in physical terms why this improves the tuning accuracy of the harmonics.[15] Naturally, the maker has to use a safety factor so that his strings will have a reasonable working life. If for any particular instrument we can decide what material was used for the strings, we can come very close to determining the pitch that the maker had in mind when he set out to conform rigidly to a particular scale.

Italian harpsichords of the eighteenth century have scales of about 266 mm (10.5) for the longer choir of strings, and we have evidence for the belief that the pitches then in use were near to our modern standard. This scale and pitch are consistent with the use of copper-alloy strings at a tension two or three semitones below that at which a typical copper-alloy string can be expected to break. (The safety margin needs to be at least two semitones because an increase of humidity will often cause an instrument's pitch to rise by a semitone.) There is, therefore, good cause to believe that copper alloys were the choice of the eighteenth-century Italian makers.[16] The general design of Italian instruments is so consistent that it is difficult to believe that the material of the wire differed in the eighteenth century from that used in the sixteenth and seventeenth centuries. The long scales must then be accepted as evidence of pitch levels considerably lower than anything which might be regarded as $8'$ pitch. The scale of the Brussels Trasuntino, on these assumptions, implies a pitch approximately three semitones below $a' = 440$ cps; those of the Donaldson Trasuntino and the Brussels Bortolotti imply pitches approximately five semitones below modern pitch; and Baffo's scale of 1574 suggests a pitch approximately seven semitones below modern pitch.[17]

An explanation may here be offered of the fact that many long-scale virginals have escaped the alterations found in long-scale harpsichords. A satisfactory method of raising the pitch of the virginals was to fit iron wire in the upper part of the compass in the Flemish manner. The bass presented no problems because the strings of a virginal are restricted in length in order to produce an instrument of convenient size, and the bass strings do, in fact,

sound better at the higher pitch. Since a virginal has fewer strings than a harpsichord, the extra tension would not be a serious problem, provided that thin wire was used.[18] Nevertheless, some virginals are found to have compass alterations or moved bridges, suggesting that this simple expedient was either not universally known or not universally approved.

The earliest surviving signed and dated harpsichord and, consequently, one of the best known of all sixteenth-century Italian instruments, is the Hieronymus Bononiensis of 1521 in the Victoria and Albert Museum.[19] This instrument now has an unusual keyboard range of C/E–d‴ (47 notes) and the two unison registers which one tends to expect on Italian instruments. Its original state must in part remain conjectural since the present keyboard, jacks, slides, and wrestplank are all replacements.[20] However, in the light of the alterations to harpsichords by Trasuntino, Baffo, and Bortolotti, we need not be too surprised to find that here also the present disposition represents a later modification. About 10 mm (0.4) has been removed from the rail that supports the front edge of the soundboard and a similar amount gained by fitting a narrower wrestplank. (A shallow rabbet in the case appears to indicate the position of the original wrestplank.) This is the usual method for gaining room for an extra register, and we may therefore be fairly confident that there was originally only one unison stop.[21]

The instrument is too small to have had a C/E–f‴ compass, so the original was almost certainly either the familiar C/E–c‴ (45 notes) or the once-common F–f‴, lacking low F♯ and G♯ (47 notes).[22] Unfortunately, the present condition of the instrument is consistent with either possibility. The cypress veneer on the wrestplank was probably transferred from the original, but it is not clear which of the two rows of tuning pins was original and both now have 47 pins (with two extra plugged holes at the left end of the front row). Between the cheeks, the keyboard space measures 726 mm (28.6), which implies keyblocks about 38 mm (1.5) wide for the C/E–c‴ compass or about 20 mm (0.8) wide for the F–f‴ compass, both of which widths are reasonable. Any estimate of the relative probability of the two compasses must therefore be made on evidence derived from other instruments.

Although the four sixteenth-century harpsichords examined in this article do not, perhaps, by themselves form a completely reliable basis for conjecture, they do agree in suggesting a prevalence of low pitches, and the conclusion is inescapable that we have been seeing the sixteenth-century instruments not as they

were originally built but as they were altered to conform to harpsichord-building practices of the seventeenth and eighteenth centuries. When it is recognized that similar alterations are likely to have been made to the Hieronymus Bononiensis, the most likely original compass would seem to be F–f‴, lacking low F♯ and G♯, which would imply a scale of 340–360 mm (13.5–14) and a pitch about five semitones below that used today.

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NOTES AND REFERENCES

1 The Bolcioni is illustrated in P. James *Early Keyboard Instruments From Their Beginnings to the Year 1820* (London 1930) plate XLV. Both instruments are illustrated and described in *The Russell Collection and Other Early Keyboard Instruments in Saint Cecilia's Hall, Edinburgh* (Edinburgh 1968) nos. 4, 2.

2 The forger needed three slides and solved his problem by slicing one of the pair horizontally along its length.

3 Strictly speaking, one can never be sure that a part is original without the testimony of the maker. In practice, parts are assumed to be original when they conform to what is known of traditional practice and when there is no evidence of non-originality.

4 Illustrated in Russell *The Harpsichord and Clavichord* (London 1959) plate 7, and in P. James, op. cit., plate XXXV.

5 The remarkable condition of this harpsichord may be judged from the fact that the cloth strip under the front of the keys still comes to an end beneath key E, and a different kind of cloth is found under the keys GG/BB–E♭. The large strip therefore predates the alteration of the compass, and there is a strong probability that it is original and has remained undisturbed for almost 400 years.

6 The unison bridge is tapered, being 17 mm (0.67) high in the bass and only 13 mm (0.53) high in the treble.

7 A similar arrangement is preserved in the 1585 Bortolotti harpsichord discussed below. It may be seen in Mersenne *Harmonie universelle* (Paris 1636) 'Liure Troisiesme, des Instrumens à Chordes,' p. 111, reproduced in F. Hubbard *Three Centuries of Harpsichord Making* (Cambridge, Mass., 1965) plate x. Both original wrestplank bridges of the Baffo have disappeared, but presumably the octave strings passed through holes in the unison wrestplank bridge, as they do in the 1585 Bortolotti. The present wrestplank bridge is a rather crude replacement and does not follow the line of the original.

8 Further alterations of a still later period, when some 250 mm (10) was roughly cut from the tail and the compass crudely enlarged to C–f‴, do not concern us here.

9 The altered keyboard was fitted with pedal pulldowns to notes C, D, E, F, G, A, B♭ and B.

10 Illustrated in Russell, op. cit., plate 8.

11 W.R. Thomas and J.J.K. Rhodes 'The string scales of Italian keyboard instruments' *Galpin Society Journal* XX (1967) 48.

12 Siculus, 1540, Benton Fletcher Collection, London.

13 Antegnato, 1537, Victoria and Albert Museum, London.

14 A virginal with a scale of 276 mm (10.9) at Ingatestone Hall, Essex, is plausibly attributed to Bonafinis—see F.G. Emmison 'A virginal by (?) Franciscus Bonafinis, 1560, at Ingatestone Hall' *Galpin Society Journal* XVII (1964) 109—but the ink inscription on the bottom giving the date 1560 is questionable.

15 Op. cit., p. 58.

16 Supporting this contention, the anonymous inventor of the Cembalo Angelico (see Russell, op. cit., p. 131, for a translation of the booklet published in Rome in 1775) refers to 'the sliding of the velvet-like plectrum on the brass string' (Article 6, section 11), as though the material of the wire should be taken for granted. Also, M. Corrette *Le Maitre de clavecin* (Paris 1753) p. 82, says that when c‴ is 'only 5 inches long, it is necessary to string the harpsichord with yellow [brass] strings...' See Hubbard, op. cit., p. 90.

17 It is interesting to notice a low pitch associated with an octave stop, giving way to a higher pitch with only unisons. The change in general brilliance would probably not have been very great.

18 It has been suggested (Thomas and Rhodes, op. cit., p. 52) that the iron stringing of long-scale virginals was the makers' intention and that these virginals were originally built to sound at 8' pitch. The existence of long-scaled harpsichords raises serious doubts about the validity of this theory.

19 R. Russell *Victoria and Albert Museum, Catalogue of Musical Instruments* I, *Keyboard Instruments* (London 1968) no. 1.

20 The present top key is made from two keys glued together, and part of the number 50 is visible on the right-hand half. An inspection of the keyframe confirms that the keyboard has been cut down from one with the common 50-note compass C/E–f‴ taken from another instrument. The jack slides, each of which now has three slots covered, may well have come from the same source. The jacks appear to have come from several instruments.

21 The single-register Italian harpsichord is the subject of Mr Hellwig's article elsewhere in this volume.

22 The balance rail of the 1537 Antegnati virginal in the Victoria and Albert Museum (Russell *Victoria and Albert Museum Catalogue*, no. 2) shows this to have been its original compass. The F–f‴ compass also appears in the intarsia of a clavichord executed between 1479 and 1482 on the wall of the Studiolo of Federigo da Montefeltro in the Ducal Palace at Urbino. See below, plate 12 of Dr Bowles' article elsewhere in this volume.